REMARKS

Claim 9 and 17 have been amended. Claims 106-114 are added. Claims 1-7, 9-87, and 106-114 are pending in the present application.

Claims 1-7, 10-15, and 24-27 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the Applicant's Admitted Prior Art, Fig. 1 and specification pages 2-3 (AAPA) in view of U.S. Patent No. 6,160,670 (Chang). Applicants respectfully traverse this rejection.

The subject matter of claims 1-7, 10-15, and 24-27 would not have been obvious over the AAPA or the AAPA in view of Chang. Indeed, the Office Action fails to establish a *prima facie* case of obviousness. To establish a *prima facie* case of obviousness, three requirements must be met: (1) some suggestion or motivation, either in the references themselves or in the knowledge of a person of ordinary skill in the art, to modify the reference or combine reference teachings; (2) a reasonable expectation of success; and (3) the prior art reference (or references when combined) must teach or suggest all the claim limitations. More importantly, the teaching or suggestion to make the claimed combination and the reasonable expectation for success must both be found in the prior art and not based on Applicant's disclosure. M.P.E.P. § 2142. See, e.g., In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974). Neither the AAPA nor Chang teach or suggest all the limitations of the claimed invention and there is no motivation to combine the teachings of the AAPA with Chang to obtain the claimed invention.

Claim 1 recites a diode comprising "an isolation region formed in a substrate; a first doped active layer . . . spaced apart from said isolation region. . .; a second doped active layer . . .; and a third doped region formed in said second doped active layer beneath said isolation region."

The AAPA as illustrated in Fig. 1 discloses that "highly doped p-type regions 40 are formed under the field oxide region 20 and an n-type implant 30 is formed between the field oxide regions 20." (Specification, page 3, lines 6-8; Fig. 1). Therefore, the AAPA does not teach or suggest that the "first doped active layer . . . is *spaced apart* from said isolation region," as recited in claim 1 (emphasis added).

Chang discloses a photodiode device where "bird's beak regions exist on the field oxide layer on each of the device." (Col. 2, lines 10-12). Chang discloses that "stress in those regions is higher and crystal defects occur there more often than in other areas," generating a large junction leakage current in those regions. (Col. 2, lines 12-14). Chang solves the problem of junction leakage resulting from high-stress and crystal defects at the bird's beak regions by providing a field oxide layer 204 in a P-type, or P-well of an N-type, substrate 200 and a heavily doped N+ region 210 spaced away from the bird's beak isolation regions. (Col. 3, lines 8-41; Fig. 2C). By placing the heavily doped N+ region 210 away from the bird's beak isolation regions, "large leakage current from that area is avoided" in the area. (Col. 3, lines 34-36). However, Chang is entirely silent on providing "a third doped region formed in said second doped active layer beneath said isolation region," as recited in claim 1. Therefore, the AAPA and Chang taken alone do not teach all the limitations of claim 1.

Moreover, there is no motivation to combine the AAPA with Chang. The problem which Chang attempts to solve is the problem of junction leakage resulting from high-stress and crystal defects at the bird's beak regions. (Col. 2, lines 12-14). However, the AAPA makes no mention of bird's beak regions in the isolation regions surrounding the device. According to the AAPA, "the overlapping of the p-type region 40 and the n-type region 30 results in current leakage from the photodiode to the substrate 10 through the depletion region." (Specification, page 3, lines 11-13). There is no suggestion in the references themselves to modify or combine their teachings.

Since the AAPA and Chang seek to improve two different devices having different problems at different types of isolation regions, there is also no suggestion or motivation for one of ordinary skill in the art to modify or combine the teachings of the cited references.

Therefore, claim 1 and dependant claims 2-7, 10-15, and 24-27 are patentable over the references. Applicants respectfully request that the 35 U.S.C. § 103(a) rejection of claims 1-7, 10-15, and 24-27 be withdrawn.

Claims 16-19, 28-35, 37-58, 60-75, and 77-87 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over AAPA in view of Chang, and further in view of U.S. Patent No. 6,150,676 (Sasaki). Applicants respectfully traverse this rejection.

Claims 16-19 depend from claim 1 and contain all the limitations of claim 1. As set forth above, the AAPA and Chang fail to teach or suggest all the limitations of claim 1 and there is motivation to combine the references to obtain the claimed invention. Sasaki cannot supplement the inadequacies of the AAPA and Chang.

Sasaki discloses that a "p-substrate 60 has a principal surface on which a field oxide film 61 is formed to isolate an active area from other active areas," and that "in the p-substrate 60 disposed in the active area, a p-well region 62 is formed." (Col. 7, lines 15-18; Fig. 5). However, Sasaki, like Chang, fails to teach or suggest "a third doped region formed in said second doped active layer beneath said isolation region," as recited in claim 1.

For at least the same reasons as set forth above regarding the motivation to combine the AAPA and Chang, there is likewise no motivation to combine Sasaki with the AAPA or Chang to achieve the claimed invention. Since the AAPA, Chang, and

Sasaki, whether considered alone or in combination do not teach or suggest all the limitations of claim 1, dependant claims 16-19 are patentable over the references.

Claim 28 relates to a diode for use in an imaging device and has been amended to recite a "diode comprising: an isolation region . . .; a first doped active layer . . ., wherein said first doped active layer is spaced apart from said isolation region; a second doped active layer . . .; and a third doped region proximate to a lower boundary of said isolation region." The AAPA, Chang, and Sasaki do not teach or suggest all the limitations of claim 28. Furthermore, there is no motivation to combine the references to obtain the claimed invention.

Claim 28 recites limitations similar to claim 1. For at least the same reasoning as that set forth above relating to claim 1, the subject matter of claim 28 and its respective depending claims 29-35 and 37-49 would not have been obvious over the AAPA, Chang, and Sasaki.

Claim 50 relates to an imager device comprising "a processor; and an imaging device . . . comprising: a photodiode." Claim 50 has been amended to recite a photodiode comprising, *inter alia,* "a first doped photoactive layer . . ., wherein said first doped layer is spaced apart from said isolation region; . . . and a third doped region formed in said second doped photoactive layer beneath said isolation region." The AAPA, Chang, and Sasaki do not teach or suggest all the limitations of claim 50, nor do they provide any suggestion or motivation to be combined with each other to obtain the claimed invention.

Claim 50 recites limitations similar to claim 1. For at least the same reasoning as that set forth above relating to claim 1, the subject matter of claim 50 and its

respective depending claims 51-58 and 60-66 would not have been obvious over the AAPA, Chang, and Sasaki.

Claim 67 relates to an imager device comprising "a processor; and an imaging device . . . comprising: a photodiode." Claim 67 has been amended to recite a photodiode comprising, *inter alia,* "a first doped photoactive layer . . ., wherein said first doped photoactive layer is spaced apart from said isolation reigon; . . . and a third doped region formed in said substrate beneath said isolation region and spaced apart from said first photoactive layer." The AAPA, Chang, and Sasaki do not teach or suggest all the limitations of claim 67, nor do they provide any suggestion or motivation to be combined with each other to obtain the claimed invention.

Claim 67 recites limitations similar to claim 1. For at least the same reasoning as that set forth above relating to claim 1, the subject matter of claim 67 and its respective depending claims 68--75 and 77-87 would not have been obvious over the AAPA, Chang, and Sasaki.

Since the AAPA, Chang, and Sasaki, do not teach or suggest all the limitations of independent claims 1, 28, 50, and 67, and since there exists no suggestion or motivation to combine the teachings of the references, these claims and respective dependant claims 16-19, 29-35, 37-49, 51-58, 60-66, 68-75, and 77-87 are patentable over the references. Applicants respectfully request that the 35 U.S.C. § 103(a) rejection of claims 16-19, 28-35, 37-58, 60-75, and 77-87 be withdrawn.

Newly added claim 106 recites a diode comprising "an isolation region formed in a substrate; a first doped active layer . . .; a second doped active layer . . .; and a third doped region . . ., wherein said third doped region is spaced away from an edge

of said isolation region at a surface of said substrate." Newly added claims 107-114 depend from claim 106.

As acknowledged in the Office Action at page 8, none of the cited references teach a third doped region "spaced away from an edge of said isolation region at a surface of said substrate," as taught by the claimed invention. The AAPA discloses a highly doped p-type region 40 "formed under the field oxide region 20 . . . [and] is aligned or self-aligned to the edge of the field oxide 20" such that a doped region under the field oxide is formed up to the edge of the field oxide region at the surface of the substrate. (Specification, page 3, lines 6-11; Fig. 1). Chang and Sasaki are both entirely silent on providing "a third doped region formed in said second doped active layer beneath said isolation region," much less one that is "spaced away from an edge of said isolation region at a surface of said substrate," as recited in claim 106. Since none of the references teach or suggest all the limitations of claim 106, claim 106 and dependent claims 107-114 further distinguish the claimed invention over the references.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

Dated: February 25, 2004

Respectfully submitted,

By_____

Thomas J. D'Amico
Registration No.: 28,371
DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP
2101 L Street NW
Washington, DC 20037-1526
(202) 785-9700
Attorney for Applicants